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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/541,298	Applicant(s) WINDISCH ET AL.	
	Examiner Nathan H. Empie	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 16 November 2007.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-17 and 20-33 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-17 and 20-33 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Examiner acknowledges receipt of 11/16/07 amendments to the specification and claims which was entered into the file. Claims 1-17, and 20-33 are currently pending.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 20-21, 28, 30, and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Windisch et al (journal article entitled "40% Efficient Thin-film Surface-textured Light-emitting Diodes by Optimization of Natural Lithography" in IEEE transactions on electron devices, vol 47, No.7, July 2000; hereafter Windisch).

2. Claims 20-21, 32: Windisch teaches an optoelectronic component (LED), comprising:

3. An optoelectonic semiconductor body (GAAS/AlGaAs LED) having a light exit surface that is patterned with structures (Fig 1, 3, pgs 1492-1494);

4. Wherein each of said structures has a ratio of depth (t) to width (b) that is in accordance with the relationship $0.1<t/b<10$; further $0.25<t/b<5$ (width of 300 nm and an etch depth of 180 nm for a $t/b = 0.6$, is taught as optimum (pg 1495 col 2)).

5. Claim 28: Further the structures in the light exit surface comprise cylindrical turrets (etched pillars (figs 1, 3)).

6. Claim 30: Further, the structures improve the coupling out of light from the optoelectronic semiconductor body (see, for example, pg 1492 col 2).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

> such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1, 4, 6-11, and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cathey et al (US patent 5,753,130; hereafter '130) in view of Windisch.

9. '130 teaches a method for roughening a surface of a semiconductor body (abstract), comprising the steps of:

10. coating the surface with a mask layer (layer 30, Fig 2. col 6 lines 8-15)

11. b) applying preformed mask bodies (elements 32, Fig 2. col 6 lines 22-36) on the mask layer (layer 30)

12. c) etching through the mask layer (layer 30) at locations not covered by mask bodies (layer 32) (Fig. 3, col 6 lines 49-53)

13. d) etching the body (11/13) at locations of its surface that are free of the mask layer (Fig. 4-6, col 7 lines 11-16, etched protrusions shown possess variety of surface structures).

14. '130 doesn't explicitly teach wherein the surface of a body is a light exit surface of an optoelectonic semiconductor body. Windisch teaches a method of roughening the surface which is a light exit surface of an optoelectronic semiconductor body (LED) comprising applying a monolayer of polystyrene spheres, and etching through the spheres to generate a textured / roughened surface (Figs 1-3 and pg 1493 2nd column - pg 1495). The method of Windisch does not explicitly teach a mask layer residing between the mask body layer and the substrate. As both '130 and Windisch teach methods of roughening / texturing a semiconductor surface utilizing mask bodies, it would have been obvious to one of ordinary skill in the art at the time of invention to have substituted one method for the other to achieve the predictable result of texturing a semiconductor surface. Therefore it would have been obvious to one of ordinary skill to have applied the method taught by '130 to a light exit surface of an optoelectronic semiconductor body.

15. Claim 4: '130 in view of Windisch teaches the method as claimed in claim 1 (described above), where '130 further teaches the mask layer (layer 30) comprising a dielectric (in present invention layer 30 is silicon dioxide, col 6 lines 8-11).

16. Claim 6: '130 in view of Windisch teaches the method as claimed in claim 1 (described above), where '130 further teaches the etching steps being carried out by means of a dry etching method (process of present invention employs dry etching to fabricate tips, col 2 lines 55-59, col 6 lines 49-53, col 7 lines 11-16, additionally Windisch teaches chemically assisted RIE (pg 1495 second column).

17. Claim 7 and 8: '130 in view of Windisch teaches the method as claimed in claim 1 (described above), where '130 further teaches the method being carried out in such a way that structures (tips 13) remain in the surface of the body (substrate 11) (Fig 7, col 7 lines 31-45), for the width (b) of which structures in relation to the etching depth (t) the following holds true: $0.1<t/b<10$, further $0.25 <t/b<5$ (tips (13) possessing heights (t) of 0.70-1.75μm, and tip widths (b) of 1-1.5μm are taught (for a range of $0.467 < t/b < 1.75$) (col 7 lines 36-45)). Additionally, Windisch teaches the width and etching depth of the texturing structures as result effective variables and teaches a width of 300nm and an etch depth of 180 nm for a $t/b = 0.6$, (pg 1495 col 2).

18. Claim 9: '130 in view of Windisch teaches the method as claimed in claim 1 (described above), where '130 further teaches the residues of the mask body (layer 32) being removed from the mask layer (layer 30) immediately after step c) (The beads 32 are removed, col 6 line 65).

19. Claim 10: '130 in view of Windisch teach the method as claimed in claim 1 (described above), where Windisch further teaches the width and etching depth of the texturing structures as result effective variables, and teaches etching depths between 0 to ~400 nm (Fig 6, pg 1492-1495). But neither '130 nor Windisch explicitly teach the etching depth in the optoelectronic semiconductor body is between 50 – 100 nm. It would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated an etching depth of between 50 – 100 nm into the method of '130 in view of Windisch, in

the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

20. Claim 11: '130 in view of Windisch teaches the method as claimed in claim 1 (described above), where '130 further teaches the mask layer (layer 30) being applied with a thickness (d) of between 10 and 100 nm (in the present invention layer 30 is deposited at 0.1 μm (or 100 nm) col 6 lines 8-11).

21. Claim 26: '130 in view of Windisch teaches the method of claim 1 (described above), where '130 further teaches the mask layer remains on the surface of the optoelectronic semiconductor body (Figs 4-6)).

22. Claim 27: '130 in view of Windisch teaches the method of claim 1 (described above), where Windisch further teaches the structures remaining in the surface of the LED comprise cylindrical turrets (etched pillars (figs 1, 3)). Although the method of '130 would appear to leave conical structures, it would have been obvious to one of ordinary skill in the art to tailor the method of '130 to fit the process of making an LED device (including generating cylindrical turrets) as taught by Windisch, as such an LED device is the outcome of the method of '130 in view of Windisch.

23. Claims 1, 4-6, 9, 10, 14 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knappenberger et al. (US 2002/0003125 A1, hereafter '125) in view of Windisch.

24. '125 teaches a method for roughening a surface of a body (substrate 11) (Fig 7, Abstract), having the following steps of:

25. a)coating the surface with a mask layer (layer 12) [0030, 0034] (Fig 2)

26. b) applying preformed mask bodies (layer 10) on the mask layer (layer 12) [0030, 0033] (Fig 2)

27. c) etching through the mask layer (layer 12) at locations not covered by mask bodies (layer 10) [0033] Fig 4

28. d) etching the body (substrate 11) at locations of its surface that are free of the mask layer [0034-35] Fig 6).

29. '125 doesn't explicitly teach wherein the surface of a body is a light exit surface of an optoelectonic semiconductor body. Windisch teaches a method of roughening the surface which is a light exit surface of an optoelectronic semiconductor body (LED) comprising applying a monolayer of polystyrene spheres, and etching through the spheres to generate a textured / roughened surface (Figs 1-3 and pg 1493 2nd column - pg 1495). The method of Windisch does not explicitly teach a mask layer residing between the mask body layer and the substrate. As both '125 and Windisch teach methods of roughening / texturing a semiconductor surface utilizing mask bodies, it would have been obvious to one of ordinary skill in the art at the time of invention to have substituted one method for the other to achieve the predictable result of texturing a semiconductor surface. Therefore it would have been obvious to one of ordinary skill to have applied the method taught by '125 to a light exit surface of an optoelectronic semiconductor body.

30. Claim 4: '125 in view of Windisch teaches the method as claimed in claim 1 (described above), where '125 further teaches the mask layer (layer 12) comprising a dielectric (silicon dioxide)([0033]).

31. Claim 5: '125 in view of Windisch teaches the method as claimed in claim 1 (described above), balls made of polystyrene being used as preformed mask bodies (elements / layer 10) (second half of [0030] states spheres 10 are preferably polystyrene).

32. Claim 6: '125 in view of Windisch teaches the method as claimed in claim 1 (described above), where '125 further teaches the etching steps being carried out by means of a dry etching method (reactive ion etching [0033] / plasma etching [0035]). Additionally Windisch teaches chemically assisted RIE (pg 1495 second column).

33. Claim 9: '125 in view of Windisch teaches the method as claimed in claim 1 (described above), where '125 further teaches the residues of the mask body (10) being removed from the mask layer (12) immediately after step c) (Fig 4 to Fig 5, [0034]).

34. Claim 10: '125 in view of Windisch teach the method as claimed in claim 1 (described above), where Windisch further teaches the width and etching depth of the texturing structures as result effective variables, and teaches etching depths between 0 to ~400 nm (Fig 6, pg 1492-1495). But neither '130 nor Windisch explicitly teach the etching depth in the optoelectronic semiconductor body is between 50 – 100 nm. It would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated an etching depth of between 50 – 100 nm into the method of '125 in view of Windisch, in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

35. Claim 14: '125 in view of Windisch teaches the method as claimed in claim 1 (described above), where '125 further teaches the etching through the mask layer (layer 12) being effected by means of an installation for reactive ion etching (reactive ion etching process is described to be performed on layer 12, [0033]).

36. Claim 26: '125 in view of Windisch teaches the method of claim 1 (described above), where '125 further teaches the mask layer remains on the surface of the optoelectronic semiconductor body (Fig 6).

37. Claim 27: '125 in view of Windisch teaches the method of claim 1 (described above), where Windisch further teaches the structures remaining in the surface of the LED comprise cylindrical turrets (etched pillars (figs 1, 3)). Although the method of '125 would appear to leave conical structures, it would have been obvious to one of ordinary skill in the art to tailor the method of '125 to fit the process of making an LED device (including generating cylindrical turrets) as taught by Windisch, as such an LED device is the outcome of the method of '125 in view of Windisch.

38. Claim 1, 4-5, 9, 10, 13 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Michiels et al. (US 2001/0014426; hereafter '426) in view of Windisch.

'426 teaches a method for roughening a surface of a body (layer 14) (Fig 10-14, Abstract), having the following steps of: a) coating the surface with a mask layer (masking layer 40) (Fig 10, [0052-53])

b) applying preformed mask bodies (masking particles (46)) on the mask layer (masking layer 40) (Fig 10, [0054,66,67])

c) etching through the mask layer (40) at locations not covered by mask bodies (46) (Fig 11, [0068])

d) etching the body (14) at locations of its surface that are free (60) of the mask layer (40/56) (Fig 12 and 13, [0069-70]).

39. '426 doesn't explicitly teach wherein the surface of a body is a light exit surface of an optoelectonic semiconductor body. Windisch teaches a method of roughening the surface which is a light exit surface of an optoelectronic semiconductor body (LED) comprising applying a monolayer of polystyrene spheres, and etching through the spheres to generate a textured / roughened surface (Figs 1-3 and pg 1493 2nd column - pg 1495). The method of Windisch does not explicitly teach a mask layer residing between the mask body layer and the substrate. As both '426 and Windisch teach methods of roughening / texturing a semiconductor surface utilizing mask bodies, it would have been obvious to one of ordinary skill in the art at the time of invention to have substituted one method for the other to achieve the predictable result of texturing a semiconductor surface. Therefore it would have been obvious to one of ordinary skill to have applied the method taught by '426 to a light exit surface of an optoelectronic semiconductor body.

40. Claim 4: '426 in view of Windisch teaches the method as claimed in claim 1 (described above), where '426 further teaches the mask layer (layer 40) comprising a dielectric (silicon dioxide)([0053]).

41. Claim 5: '426 in view of Windisch teaches the method as claimed in claim 1 (described above), where '426 further teaches balls made of polystyrene being used as preformed mask bodies (46) ([0055]).

42. Claim 9: '426 in view of Windisch teaches the method as claimed in claim 1 (described above), where '426 further teaches the residues of the mask body (46) being removed from the mask layer (40) immediately after step c) (Fig 11-12, [0069]).

43. Claim 10: '426 in view of Windisch teach the method as claimed in claim 1 (described above), where Windisch further teaches the width and etching depth of the texturing structures as result effective variables, and teaches etching depths between 0 to ~400 nm (Fig 6, pg 1492-1495). But neither '130 nor Windisch explicitly teach the etching depth in the optoelectronic semiconductor body is between 50 – 100 nm. It would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated an etching depth of between 50 – 100 nm into the method of '426 in view of Windisch, in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

44. Claim 13: '426 in view of Windisch teaches the method as claimed in claim 1 (described above), where '426 further teaches the first etching step being effected by means of a process step which etches the mask bodies (46) to a greater degree than the body (14) (acetone is utilized to remove masking particles and feet from surface of (14) without significant etching of 14) (Fig 11-12, [0069]).

45. Claim 24: '426 in view of Windisch teaches the method of claim 1 (described above), where '426 further teaches the preformed mask bodies are applied as a monolayer on the surface of the mask layer in a random arrangement (Fig 8 shows randomness, and Fig 1-3, 9-11 teach a monolayer of particles).

46. Claim 26: '426 in view of Windisch teaches the method of claim 1 (described above), where '426 further teaches the mask layer remains on the surface of the optoelectronic semiconductor body (Fig 13).

47. Claim 27: '426 in view of Windisch teaches the method of claim 1 (described above), where Windisch further teaches the structures remaining in the surface of the LED comprise cylindrical turrets

(etched pillars (figs 1, 3)). Although the method of '426 would appear to leave conical structures, it would have been obvious to one of ordinary skill in the art to tailor the method of '426 to fit the process of making an LED device (including generating cylindrical turrets) as taught by Windisch, as such an LED device is the outcome of the method of '426 in view of Windisch.

48. Claim 1 4-5, 9, 10, 12, and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alwan (US patent 5,676,853; hereafter '853) in view of Windisch

'853 teaches a method for roughening a surface of a body (layer 14) (Fig 6-8, col 3 lines3 - 10), having the following steps of: a) coating the surface with a mask layer (oxide layer 16) (Fig 2, col 4 lines 7 - 16)

b) applying preformed mask bodies (mask particles (24)) on the mask layer (oxide layer 16) (Fig 2, col 4 lines 25-42)

c) etching through the mask layer (16) at locations not covered by mask bodies (24) (Fig 5 and 6, col 6 lines 4-18, col 7 lines 1-7)

d) etching the body (14) at locations of its surface that are free of the mask layer (16) (Fig 8, col 7 lines 17-30).

49. '853 doesn't explicitly teach wherein the surface of a body is a light exit surface of an optoelectonic semiconductor body. Windisch teaches a method of roughening the surface which is a light exit surface of an optoelectronic semiconductor body (LED) comprising applying a monolayer of polystyrene spheres, and etching through the spheres to generate a textured / roughened surface (Figs 1-3 and pg 1493 2nd column - pg 1495). The method of Windisch does not explicitly teach a mask layer residing between the mask body layer and the substrate. As both '853 and Windisch teach methods of roughening / texturing a semiconductor surface utilizing mask bodies, it would have been obvious to one of ordinary skill in the art at the time of invention to have substituted one method for the other to achieve

the predictable result of texturing a semiconductor surface. Therefore it would have been obvious to one of ordinary skill to have applied the method taught by '853 to a light exit surface of an optoelectronic semiconductor body.

50. Claim 4: '853 in view of Windisch teaches the method as claimed in claim 1 (described above), where '853 further teaches the mask layer (layer 16) comprising a dielectric (oxide layer) (col 4 lines 7-16).

51. Claim 5: '853 in view of Windisch teaches the method as claimed in claim 1 (described above), where '853 further teaches balls made of polystyrene being used as preformed mask bodies (24) (col 6 lines 19-30).

52. Claim 9: '853 in view of Windisch teaches the method as claimed in claim 1 (described above), where '853 further teaches the residues of the mask body (24) being removed from the mask layer (16) immediately after step c) (Fig 6-7, col 7 lines 1-16).

53. Claim 10: '853 in view of Windisch teach the method as claimed in claim 1 (described above), where Windisch further teaches the width and etching depth of the texturing structures as result effective variables, and teaches etching depths between 0 to ~400 nm (Fig 6, pg 1492-1495). But neither '130 nor Windisch explicitly teach the etching depth in the optoelectronic semiconductor body is between 50 – 100 nm. It would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated an etching depth of between 50 – 100 nm into the method of '853 in view of Windisch, in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

54. Claim 12: '853 in view of Windisch teaches the method as claimed in claim 1 (described above), where '853 further teaches the mask bodies (mask particles (24), on the mask layer (16), having a lateral extent (A) (a diameter) of between 150 and 300 nm (between 200-5000 nm) (claim 12). Additionally, Windisch teaches 300, and 400 nm diameter polystyrene spheres (pg 1495 2nd column).

55. Claim 24: ‘853 in view of Windisch teaches the method of claim 1 (described above), where ‘853 further teaches the preformed mask bodies are applied as a monolayer on the surface of the mask layer in a random arrangement (Fig 1 shows randomness, and col 3 lines 45 – 55 describe a contiguous monolayer of particles).

56. Claim 26: ‘853 in view of Windisch teaches the method of claim 1 (described above), where ‘853 further teaches the mask layer remains on the surface of the optoelectronic semiconductor body (Fig 3).

57. Claim 27: ‘853 in view of Windisch teaches the method of claim 1 (described above), where Windisch further teaches the structures remaining in the surface of the LED comprise cylindrical turrets (etched pillars (figs 1, 3)). Although the method of ‘853 would appear to leave conical structures, it would have been obvious to one of ordinary skill in the art to tailor the method of ‘853 to fit the process of making an LED device (including generating cylindrical turrets) as taught by Windisch, as such an LED device is the outcome of the method of ‘853 in view of Windisch.

58. Claims 2, 3, 22-23, 29, 31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over '130 in view of Windisch as applied to claim1 above, and further in view of Streubel et al (journal article entitled "High Brightness AlGaInP Light emitting Diodes" IEEE Journal of selected topics in quantum electronics, vol. 8 no. 2 March / April 2002; hereafter Streubel).

59. Claim 2: ‘130 in view of Windisch teaches the method as claimed in claim 1 (described above), where the method of ‘130 is applied to a light exiting surface of an optoelectronic semiconductor body (LED) of Windisch resulting in a surface textured LED. Neither ‘130 nor Windisch teach that the LED body contains aluminum gallium indium phosphide. Streubel teaches method of forming high brightness LED devices, including surface textured LEDs, making reference to the Windisch article (pg 321, 324-326, 328 - 329). Streubel further teaches that development of very bright visible devices (with regard to red and yellow) has been enabled by the AlGaInP material system (pg 321, 1st col). Therefore it would

have been obvious to one of ordinary skill in the art at the time of invention to have incorporated AlGaInP, as taught by Streubel, into the LED body of '130 in view of Windisch to obtain a very bright LED device exhibiting red and yellow colors.

60. Claim 3: '130 in view of Windisch teaches the method as claimed in claim 1 (described above), where the method of '130 is applied to a light exiting surface of an optoelectronic semiconductor body (LED) of Windisch resulting in a surface textured LED. Neither '130 nor Windisch teach that the LED body contains aluminum gallium indium nitride. Streubel teaches method of forming high brightness LED devices, including surface textured LEDs, making reference to the Windisch article (pg 321, 324-326, 328 - 329). Streubel further teaches that development of very bright visible devices (with regard to green and blue) has been enabled by the AlGaInN material system (pg 321, 1st col). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated AlGaInN, as taught by Streubel, into the LED body of '130 in view of Windisch to obtain a very bright LED device exhibiting green and blue colors.

61. Claim 22, 23, 33: '130 in view of Windisch as applied in the rejection to claims, 1, 7 and 8 (above) teaches an optoelectronic component (LED), comprising:

62. An optoelectonic semiconductor body (GAAS/AlGaAs LED) having a light exit surface that is patterned with structures (Fig 1, 3, pgs 1492-1494);

63. Wherein each of said structures has a ratio of depth (t) to width (b) that is in accordance with the relationship $0.1<t/b<10$; further $0.25<t/b<5$ (Windisch teaches width of 300 nm and an etch depth of 180 nm for a $t/b = 0.6$, is taught as optimum (pg 1495 col 2), and '130 teaches tips (13) possessing heights (t) of 0.70-1.75μm, and tip widths (b) of 1-1.5μm are taught (for a range of $0.467 < t/b < 1.75$) (col 7 lines 36-45)).

64. Neither '130 nor Windisch teach that the LED body contains aluminum gallium indium nitride or aluminum gallium indium phosphide. Streubel teaches method of forming high brightness LED devices,

including surface textured LEDs, making reference to the Windisch article (pg 321, 324-326, 328 - 329). Streubel further teaches that development of very bright visible devices (with regard to green and blue) has been enabled by the AlGaInN material system, or (with regard to red and yellow) has been enabled by the AlGaInP material system (pg 321, 1st col). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated AlGaInN or AlGaInP, as taught by Streubel, into the LED body of '130 in view of Windisch to obtain a very bright LED device exhibiting green and blue colors, or red and yellow colors respectively.

65. Claim 29: '130 in view of Windisch and Streubel teaches the method of claim 22 (described above), where Windisch further teaches the structures remaining in the surface of the LED comprise cylindrical turrets (etched pillars (figs 1, 3)). The method of '130 would appear to leave a variety of structures (Fig 4, 5, and 6), it would have been obvious to one of ordinary skill in the art to tailor the method of '130 to fit the process of making an LED device (including generating cylindrical turrets) as taught by Windisch and Streubel, as such an LED device is the outcome of the method of '130 in view of Windisch and Streubel.

66. Claim 31: Further, the structures improve the coupling out of light from the optoelectronic semiconductor body (see, for example, pg 1492 col 2).

67. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over '125 in view of Windisch as applied to claim 14 above, and further in view of '130.

68. Claim 15: '125 in view of Windisch teaches the method as claimed in claim 14 (described above) where '125 teaches the mask layer (12) is silicon dioxide ([0033]), but neither '125 nor Windisch teaches a mixture of CHF_3 and Ar being used as etching gas to etch the SiO_2 layer. '130 teaches the use of an etchant gas comprising CF_2, CHF_3, and argon were used to plasma etch silicon dioxide, as these etchant gases are selective with respect to silicon dioxide (col 6 lines 54 – 62). The motivation to select an

etchant gas comprising CF_2, CHF_3, and argon for an etching process involving a silicon dioxide etch mask and a latex mask is that '130 teaches that this gas mixture would selectively etch silicon dioxide. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated the etching gas mixture described by '130 into the process of etching a silicon dioxide resist masked by a latex material as taught by '125 in view of Windisch as it would have provided an etching gas suitable to selectively etch the silicon dioxide layer.

69. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over '125 in view of Windisch as applied to claim 1 above, and further in view of Huang et al. (US 2002/0176474; hereafter '474).

70. '125 in view of Windisch teaches the method as claimed in claim 1 (described above), the body (substrate 11) being etched by means of plasma etching [0035]. But '125 does not specify an installation suitable for an inductively coupled plasma. '474 teaches an inductively coupled etch (ICP) process to etch a semiconductive substrate ([0104]). The motivation to incorporate an installation for ICP to perform the claimed etch process is because ICP provides the benefit of comparatively low ion energies ('474 [0104]). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have selected the ICP process as taught by '474 to perform the etch process taught by '125 in view of Windisch because it would reap the benefit of comparatively low ion energies.

71. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over '125 in view of Windisch and '474 as applied to claim 16, and further in view of Streubel and Shul et al. (US patent 5,624,529; hereafter '529).

72. '125 in view of '474 teach the method as claimed in claim 16 (described above), but neither '125 nor '474 teach a mixture of CH_4 and H_2 being used as etching gas. The method of '125 in view of Windisch is applied to a light exiting surface of an optoelectronic semiconductor body (LED) of

Windisch resulting in a surface textured LED. Neither '125 nor Windisch teach that the LED body contains aluminum gallium indium phosphide. Streubel teaches method of forming high brightness LED devices, including surface textured LEDs, making reference to the Windisch article (pg 321, 324-326, 328 - 329). Streubel further teaches that development of very bright visible devices (with regard to red and yellow) has been enabled by the AlGaInP material system (pg 321, 1st col). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated AlGaInP, as taught by Streubel, into the LED body of '125 in view of Windisch to obtain a very bright LED device exhibiting red and yellow colors.

73. The etching composition originally disclosed by the method of '125 was tailored to a to silicon substrate [0035]. Because of the incorporation of AlGaInP into the substrate it would have been obvious to one of ordinary skill in the art that a preferred etching solution should have been used. '529 teaches such a suitable etchant for etching a GaInP/AlGaInP material, where the etchant is composed of 2 sccm CH_4 and 20 sccm H_2 (col 6 lines 42-60). The motivation to select the etchant taught by '529 with the process described by '125 would be that suitable etchants should be used for various substrates, no one chemistry is sufficient for all systems, so for processing (for example) a GaIn/AlGaInP substrate, '529 recommends an appropriate chemistry. It would have been obvious of one of ordinary skill in the art at the time of invention to have utilized the etchant chemistry of '529 into the process described by '125 as it teaches a recommended dry etching chemistry to be used when etching GaIn/AlGaInP materials.

74. Claims 24, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over '130 in view of Windisch as applied to claim 1 above, and further in view of Deckman et al. (journal article "Natural Lithography" Appl. Phys. Lett. 41 (4) 15 Aug 1982; hereafter Deckman).

75. Claims 24, 25: '130 view of Windisch teaches the method of claim 1, where of '130 teaches a single layer of mask bodies (32) (Fig 2), '130 doesn't explicitly teach whether the monolayer is in a

random or regular arrangement. When a primary reference is silent as to a certain detail, one of ordinary skill would be motivated to consult a secondary reference which satisfies the deficiencies of the primary reference. Deckman teaches the basis to the method of patterning surfaces with spherical particles (pg 377). Deckman further teaches that the method could be utilized to arrange either a random or ordered monolayer of spheres over the entire surface to be used as a lithographic mask (pg 377-8). As both '130 in view of Windisch and Deckman teach methods of forming monolayers of polymer spheres to act as masking bodies it would have been obvious to one skilled in the art to incorporate either a random or regular arrangement of mask bodies to achieve the predictable result of forming a monolayer of polymer spheres possessing such arrangements.

76. Claims 24, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over '125 in view of Windisch as applied to claim 1 above, and further in view of Deckman.

77. Claims 24, 25: '125 view of Windisch teaches the method of claim 1, where of '125 teaches a single layer of mask bodies (10) (Fig 2), '125 doesn't explicitly teach whether the monolayer is in a random or regular arrangement. When a primary reference is silent as to a certain detail, one of ordinary skill would be motivated to consult a secondary reference which satisfies the deficiencies of the primary reference. Deckman teaches the basis to the method of patterning surfaces with spherical particles (pg 377). Deckman further teaches that the method could be utilized to arrange either a random or ordered monolayer of spheres over the entire surface to be used as a lithographic mask (pg 377-8). As both '125 in view of Windisch and Deckman teach methods of forming monolayers of polymer spheres to act as masking bodies it would have been obvious to one skilled in the art to incorporate either a random or regular arrangement of mask bodies to achieve the predictable result of forming a monolayer of polymer spheres possessing such arrangements.

Response to Arguments

78. Applicant's arguments in reference to the amendments filed 11/16/07, with respect to the specification and claims, have been fully considered and are persuasive. The objection to the specification of 6/12/07 has been withdrawn.

79. Applicant's arguments in reference to the new amendments, see pgs 15-23, filed 11/16/07, with respect to the rejection(s) of claim(s) 1, 20 and 22 and their dependencies under USC 102 (b) and 103 (a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made further in view of Windisch, Streubel and Deckman (described above). It is the examiners opinion that the methods taught by the prior art references applied in the office action dated 11/16/07 generally taught articles and processes of making articles possessing roughened surfaces utilizing mask bodies. Although the methods taught by the prior art references in the previous office action dealt with forming field emitters, one of ordinary skill in the art would appreciate that such general steps could be applied to produce a variety of articles necessitating roughened / textured surfaces; especially after considering how similar methods of utilizing mask bodies to roughen/ texture surfaces of a variety of materials including LED light exit surfaces are taught by Windisch, Streubel and Deckman.

Conclusion

80. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH

shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan H. Empie whose telephone number is (571) 270-1886. The examiner can normally be reached on M-F, 7:00- 4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571) 272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NHE

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SUPERVISORY PATENT EXAMINER